MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2022/2023

DBM5014 – BUSINESS MATHEMATICS

(*for Diploma students only*)

7 OCTOBER 2023
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **3** pages excluding cover page and appendix.

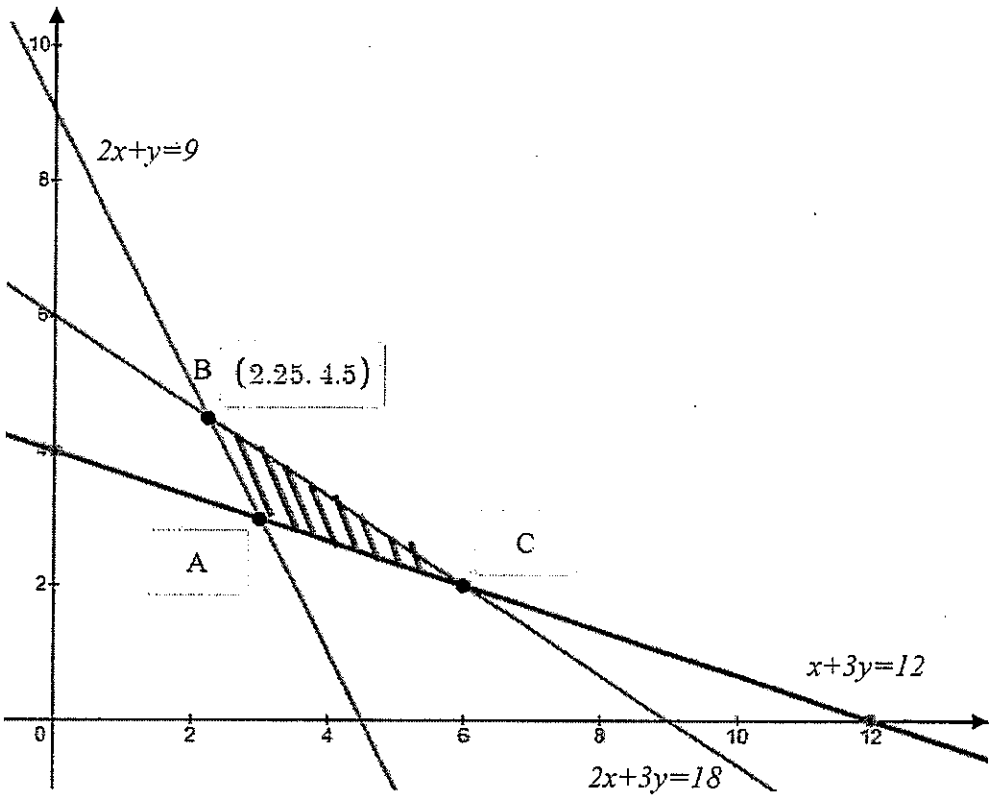
2. Attempt **ALL FOUR (4)** questions. The marks distribution for each question is given.

3. Write your answers in the answer booklet provided.

4. Key formulae are given in the Appendix.

Question 1

a. Coffee Box just released 2 festive flavors for Christmas, the *Red Velvet Coffee* (***x***) selling at RM21.90 and *Peppermint Mocha* (***y***) selling at RM24.90. The market research was conducted prior to the release and the risk and perception of the markets are shown in the graph below:



i. State the linear inequalities obtained from the graph above. (4 marks)

ii. From the graph, find the coordinate of **Point A**. (6 marks)

iii. From the graph, find the coordinate of **Point C**. (6 marks)

iv. Based on the price above, prepare the profit function if the profit is 30% from the final selling price. (3 marks)

v. Evaluate all the corner points and determine the maximum profit based on the objective function in (**iv**). How much of each flavor of coffee should Coffee Box sells to maximize their profit? (5 marks)

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b. Aikiya manufactures home furniture. Two of their best selling product are types of loft bed (x) and sofa bed (y). Each of the product collect profit at RM1,250 and RM2,200 respectively. There are 2000 resource units available every day from which the loft bed requires 50 units while sofa bed requires 24 units. And each unit of loft bed needs 30 minutes of processing time and each unit of sofa bed needs 33 minutes of processing time. Total processing time available in a day is 900 minutes. To meet the demand, total number of production should be at least 500 units. And due to popularity, sofa bed should not be less than loft bed.

i. Prepare the objective function for profit collected by Aikiya. (1 mark)

ii. List all the constraints according to the situation above. (5 marks)

[TOTAL 30 MARKS]

Question 2

a. You would like to buy the new Tesla Model which cost RM220,000. However, you would like to compare the loan offered between 3.5% simple interest for 9 years from Bank A and 2.8% simple interest for 8 years from Bank B. Both of the banks will finance the balance of the car price after you pay 10% deposits.

i. Calculate the amount of loan that you will take from the bank. (2 marks)

ii. What is the monthly payment if you choose Bank A to finance the car? (5 marks)

iii. How much is the monthly payment offered by Bank B? (5 marks)

iv. Find the difference between the monthly payment of the two banks. (2 marks)

b. Instead of taking loan to buy the car, you ponder upon the idea of saving RM5,200 every 3 months for 5 years into an account paying 3% interest compounded quarterly.

i. How much will you have in the account after 5 years? (4 marks)

ii. How much interest have you earned? (2 marks)

c. You found a bank that gives you interest of 3.15% compounded monthly. How much do you need to put into the bank every month to reach a total of RM220,000 after 7 years. (5 marks)

d. You have a monthly liability commitment of RM3,456. Total monthly liability commitment you can afford is RM7,890. Based on these, if you would like a bank to finance your house purchase for 30 years. What is the maximum price of the house that you can afford with an interest of 3.33% p.a. compounded monthly? (5 marks)

[TOTAL 30 MARKS]

Continued...

Question 3

a. Given a function $y = 888x - x^{88} + \frac{22}{x^4} - 8\ln x$. Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$. (9 marks)

b. Find the first derivative of $f(x) = \sqrt{x^3 + 4x}$ by using **Chain Rule**. (4 marks)

c. Given that the total profit function of *Zukafe* company is $P(x) = \left(x^3 - x + 1\right) \cdot e^x$, where x is the kilogram of coffee beans sold in a day.

i. Find the marginal profit function, $P'(x)$. (5 marks)

ii. Find the marginal profit when the company sold 0.2 kilograms of coffee beans in a day. (2 marks)

[TOTAL 20 MARKS]

Question 4

a. Evaluate each of the following integrals.

i. $\int \frac{4x^5 - 1}{x^2} dx$ (4 marks)

ii. $\int_4^9 (x^{-1/2} + x^2) dx$ (5 marks)

b. Solve $\int \frac{25t^4}{t^5 + 25} dt$ by using **Substitution Rule.** (6 marks)

c. A manufacturer's marginal revenue function is $\frac{dR}{dx} = x^{-9/4}$, where x is the number of units sold. What is the total revenue, R, of selling from 1 to 16 units?

(5 marks)

[TOTAL 20 MARKS]

End of Paper.

APPENDIX 1: FORMULAE

Simple Interest	***Compound Interest***
$I = Prn$	$FV = PV\left(1+\frac{r}{n}\right)^{nt}$
Present Value Annuities	***Future Values Annuities***
$A = R\left[\frac{1-\left(1+r/n\right)^{-nt}}{r/n}\right]$	$S = R\left[\frac{\left(1+r/n\right)^{nt}-1}{r/n}\right]$

Product Rule	***Quotient Rule***	***Chain Rule***
$\frac{d}{dx}\left[f(x)\cdot g(x)\right] = fg'+gf'$	$\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{gf'-fg'}{g^2}$	$\frac{d}{dx}f\left[g(x)\right] = f'\left[g(x)\right]\cdot\frac{d}{dx}g(x)$

Logarithm Rule	***Exponential Functions***
$\frac{d}{dx}\ln u = \frac{1}{u}\cdot\frac{du}{dx}$	$\frac{d}{dx}e^u = e^u\frac{du}{dx}$

Integration	
$\int k\,dx = kx + C$	$\int x^n\,dx = \frac{x^{n+1}}{n+1} + C, \quad n \neq 1$
$\int e^x\,dx = e^x + C$	$\int \frac{1}{x}dx = \ln x + C$

Definite Integral

$\int_a^b f'(x)\,dx = f(b) - f(a)$